dietary vary to some extent at different places and at different seasons. These observations will ultimately demonstrate what organisms are valuable as fish-foods and what are not; the proportion in which the various vertebrates compose the dietary of fishes; and the possibility of introducing a valuable food-fish, such as the English sole, in places where it is absent or scarce. They will also show in what way the organisms forming the food of fishes may be protected and improved.

In a Report on the spawning and spawning-places of food-fishes, Dr. Fulton describes the results of the observations made during the year, many thousands of fishes having been examined on board the *Garland* all along the coast, and the duration of their spawning period in most instances determined. The duration of the spawning period varies much in different fish, and in some cases fully-grown adults appear not to spawn every year. The majority of the food-fishes congregate at the spawning time in immense shoals on the east coast at grounds lying from about eight to above twenty miles from shore in what may be termed the extra-territorial spawning zone. The young fishes are not, as a rule, found at the place of spawning, the floating pelagic eggs being carried by the currents chiefly shorewards. Dr. Fulton gives reasons for the belief that the selection of a particular offshore ground for spawning depends upon the set of the surface currents at the spawning season, these carrying the floating eggs during their development to the zones where food for the young fishes is abundant and shelter most readily secured.

Prof. W. C. McIntosh has made an elaborate study of the pelagic fauna of St. Andrews Bay, of which the second part, dealing with the distribution of the invertebrate organisms which form the food of many larval and other fishes, is now given.

Prof. McIntosh has also, in another paper, described the ova of the food-fishes and the larval and post-larval stages obtained in the *Garland's* tow-nets at various parts of the coast. These include the ova or larvæ of plaice, lemon-sole, flounders, dabs, cod, haddocks, ling, whiting, &c., and they constitute an indispensable part of the general study of the reproduction of the food-fishes.

Mr. Thomas Scott, in his valuable additions to the fauna of the Firth of Forth, gives a list of 80 species of organisms, not previously recognized as belonging to that locality. Some of these are for the first time recorded from the east of Scotland; some are new to Britain, and a few new to science. This paper is illustrated by two plates.

Mr. Scott, in his Report on the invertebrate fauna of inland waters, gives the result of the first investigations into the invertebrate organisms present in Scottish lochs and inland waters ever carried on in this country.

Dr. Fullarton's paper on the development of the clam is one which would hardly have found acceptance in any scientific journal. Had text and plates been submitted to the judgment of a skilled investigator, there would have been little or nothing of either for publication, as both display gross inaccuracy. There are many very remarkable statements in this paper, and the author naïvely describes as normal, phenomena whose pathological nature the merest tyro ought to be able to recognize.

Dr. John Beard, in his paper (illustrated by three plates) on the development of the common skate, gives the result of the study of this subject, on which very little has been written, though the skate is one of the most common elasmobranch fishes of our seas. The development of the embryo as it lies within its "purse" at the bottom of the seas occupies probably nine or ten months, being more rapid in summer than in winter. The eggs may be deposited throughout the year, but chiefly in March and April. Dr. Beard furnishes minute descriptions of the egg-cases or "purses" of the various species of skates and rays, and of the various stages in the development of the embryo. He discusses the function of the temporary external gills, so characteristic in advanced stages of development; and, in opposition to other authorities, he gives good reason for the belief that they are purely respiratory in function, and are adapted to the special conditions under which the developing embryo is placed.

Dr. Fulton, in his paper on the proportional numbers and sizes of the sexes among sea-fishes, gives the results of his inquiries, based upon the examination of 12,666 fishes. Females are, as a rule, more numerous than males; the female is also as a rule larger, but the male is the larger among the cod, haddock, and a few other fishes.

Among the "Notes and Memoranda" will be found Mr. Scott's hybridism among fish, the account of ingenious and interesting experiments made on board the *Garland* on the artificial fertilizing of the ova of certain species of sea-fishes with the milt of other species sometimes widely separated zoologically. Dr. Fulton sends interesting notes on the reproduction and migrations of the common eel, and on the presence of anchovies in Scotch waters. Regarding the former paper, it should be remembered that a German zoologist recently obtained a conger-eel at Zanzibar with eggs ten times the size of those here described. There is nothing really remarkable in the reproductive organs of the eel obtained at Howietoun, eels with eggs as large being very often caught. It has usually been estimated that the eel produces five millions of ova. The number is here increased to upwards of ten millions, and the method by which this was counted is not given. There is a lamentable looseness in quoting literature, even that of British zoology. We are told that *Myxine* is a protandric hermaphrodite, and that this was discovered by Nansen. As a matter of fact, the discovery was made by a Scotch naturalist (Cunningham), and within a short distance of Edinburgh. If Nansen's paper had been read as well as quoted, this misstatement would not have been made.

Section C contains notes on contemporary work relating to fisheries in this and other countries. We note that no mention is made, however, of the very important "Plankton" expedition of Germany of last year, which is the more to be wondered at as interesting accounts of the expedition have been published in Germany.

It is much to be regretted that the Fishery Board Bill of last year did not become law. The conduct of scientific investigations might then have been placed in different hands, with the result, among other things, that properly-organized scientific work would have been carried on by a thoroughly competent scientific staff, and the Government grant of £2000 a year usefully and judiciously expended, instead of being, as at present, frittered away because the dominant clique of the Fishery Board do not know what to do with it. The Scientific Department of the Fishery Board needs reorganization quite as much as the Fishery Board itself. Under the control and direction of the leading Scottish biologists, some adequate return ought to be made for the nation's money. To do this, however, the work must be properly planned and directed, and moreover the working of the different investigations given only to men who really understand their subject. Government has been asked, and is asked in the present Report, to furnish increased funds. We hope and believe that the authorities will be wise enough to stay their hand till they can reorganize everything connected with the Fishery Board.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. Love, St. John's, and Mr. Coates, Queens', have been appointed Moderators, and Mr. Wallis, Corpus, and Mr. Burnside, Pembroke, Examiners for the next Mathematical Tripos, Part I.

Mr. L. Fletcher, Keeper of Minerals at the British Museum, and Mr. H. P. Gurney, of Clare College, are nominated Examiners in Mineralogy for the Natural Sciences Tripos.

Mr. H. M. Stanley was, on October 23, admitted to the honorary degree of LL.D.

The following communications were made to the Cambridge Philosophical Society at the annual general meeting on October 27:—The President, the origin and early years of the Society; Mr. C. Chree, on the vibrations of some simple systems; Dr. A. Gamgee, on the principle on which Fahrenheit constructed his thermometrical scale; Mr. H. J. Sharpe, on liquid jets.

The Harkness Scholarship for Women, tenable at either Girton College or Newnham College, Cambridge, is to be awarded triennially to the best candidate in an examination in geology and palæontology, provided that sufficient proficiency is shown. The candidates must be resident members of Girton or Newnham College, in their first or second term. The Scholarship will be of the value of about £35 a year for three years. The next award will be made in 1891. The examination will be held at Cambridge in the Michaelmas Term, and the award will be made on or before November 15, 1891. The intended range of examination is indicated by the following schedule:—General physical geography; such geological phenomena as are matters of common observation; the principal agencies which change or modify the earth's surface and the life on it; outlines

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of the stratigraphy of the United Kingdom; outlines of the classification of organized beings, existing and extinct; the commoner rocks and rock-forming minerals, and the commonest and most characteristic British fossils. Candidates must send in their names, on or before October 12, 1891, to Miss A. Johnson, Llandaff House, Cambridge, from whom further information may be obtained.

SCIENTIFIC SERIALS.

American Journal of Science, October 1890.—A description of the "Bernardston Series" of metamorphic Upper Devonian rocks, by Prof. Ben. K. Emerson. With respect to this paper, Prof. J. D. Dana remarks:—"Prof. Emerson has given the region a thorough investigation, in which he has removed the doubts as to the relations of the beds, made out, as far as possible, the system of faults and flexures, studied the rocks as to their kinds and transitions, and determined the age of the series to be Upper Devonian. The paper will be accepted in America, and should be elsewhere, as putting the facts beyond doubt that gneiss, diorite, granite, and the other crystalline rocks described are not always of Archæan or pre-Cambrian make; that granite and diorite are not always of igneous origin; and these conclusions are made sure on the well-established criterion of age, that is, fossils—Crinoids, Corals, Brachiopods."—On the circular polarization of certain tartrate solutions, by J. H. Long. The author describes certain peculiarities of solutions of potassium antimony tartrate, when mixed with potassium or sodium carbonate, acetate, or phosphate in amounts insufficient to produce immediate precipitation. A decrease of specific rotation took place in the case of each of the mixtures. It is probable, therefore, that a temporarily stable antimony salt is formed with a corresponding amount of alkali tartrate. The observed rotation is due to this in conjunction with that of the potassium antimony tartrate which remained unchanged.—A rapid method for the detection of iodine, bromine, and chlorine, in presence of one another, by F. A. Gooch and F. T. Brooks.—Metacinnabarite from New Almaden, California, by W. H. Melville.—On the Keokuk Beds at Keokuk, Iowa, by C. H. Gordon.—Note on the vapour-tension of sulphuric acid, with the description of an accurate cathetometer microscope, by Dr. Chas. A. Perkins. The author finds that the vapour-tension is not greater than about 0·01 mm. at ordinary temperatures.—Experiments upon the constitution of the natural silicates, by F. W. Clarke and E. A. Schneider.—On five new American meteorites, by George F. Kunz. Descriptions and analyses are given of the group of meteorites recently discovered in Brenham Township, Kiowa County, Kansas; the Winnebago County, Iowa, meteorite; the meteoric stone from Ferguson, Haywood County, North Carolina; the meteoric iron from Bridgewater, Burke County, North Carolina; and the meteoric iron from Summit, Blount County, Alabama.—On the determination of the coefficient of cubical expansion of a solid from the observation of the temperature at which water, in a vessel made of thin solid, has the same apparent volume as it has at 0° C.; and on the coefficient of cubical expansion of a substance determined by means of a hydrometer made of this substance, by Alfred M. Mayer.

THE *American Meteorological Journal* for October contains articles:—On cyclical periodicity in meteorological phenomena, by E. D. Archibald, in which he advocates investigations as to the possible connection between weather and other physical agencies, on the following plan: (1) the collection and analysis of all previous investigations which bear traces of any value, and their distribution under the head of the particular element dealt with; (2) the arrangement of the periods in the matter of length; (3) the choice of the particular working hypothesis intended to be employed, and the working out of its supposed effects in different parts of the world; (4) the reduction and comparison of the data representing the various elements, and their comparison with the deductions from the hypothesis; (5) the investigation of the causes of apparent exceptions, and the exhibition of the final results, both in tabular and graphic form.—On accessory phenomena of cyclones, by H. Faye. The author draws attention to the theories of Redfield and Reid, and to the contradictory theories of Espy and Bache, from which he argues that only one conclusion could be drawn, viz. that there were two entirely different kinds of storms and tornadoes; and he refers to the advance made by the study of synoptic charts, both as regards the movements of cyclones and thunderstorms. The article contains an illustration of what he assumes to be a typical figure of a cyclone.—On temperatures in and near forests, by Prof. M. W. Harrington. The author shows that this subject admits of a much less satisfactory solution than that of soil temperatures discussed in an earlier paper. The observations used are from several sources over Central Europe, and refer in this part of the discussion to differences of temperature extremes. They show that the forest cuts off the mean daily maxima on the yearly average to the extent of 2° or 3°; the effect is most marked in summer and least in winter. The action of the forest on the minima of temperature is also a moderating one: the temperature does not on the average fall as low in forests as outside. With long-continued unchanging weather the peculiarities of forest climate tend to disappear.—On the Meteorological Section of the French Association for the Advancement of Science, held at Limoges in August last, by A. L. Rotch. The attendance of meteorologists was not large, but some important matters were discussed, among which may be mentioned the use of self-recording instruments on mountain stations, the subject being introduced by M. Teisserenc de Bort, and a paper on the recent seismic activity of Japan, by M. Y. Wada, of Tokio.

IN the *Journal of Botany* for October is a very interesting biographical sketch, accompanied by an excellent portrait, of the late Mr. John Ralfs, of Penzance, whose classical work, "The British Desmidieæ," one of the most valuable monographs ever published, was brought out as long ago as 1848. The value of this work may be judged from the fact that before its publication the number of species of Desmids recorded as British was four. An interesting note is given on the fertilization of the sugar-cane, by Dr. Fressanges, President of the Medical Society of Mauritius.

THE greater part of the number of the *Nuovo Giornale Botanico Italiano* for October is occupied by the completion of Signor L. Nicotra's interesting and important paper on the flora of Sicily. Going through the natural orders successively, he describes in general terms the representation of the order in the flora of the island, and points out the contrast between the flora of its north-eastern and that of its south-western portion, due to geological causes, the former having more of a European, the latter more of a North African character. Some particulars are added with regard to the flora of the small islands adjacent to Sicily. The remaining articles in the number are of special interest to Italian botanists.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, October 20.—M. Duchartre in the chair.—Study of the movement of a double cone which appears to rise, though it really descends, on an inclined plane, by M. H. Resal. A double cone placed on two guides inclined to the horizon, and nearer to one another at the lower than at the upper end, appears to ascend. The author has studied the mechanics of this movement.—Note on lightning-flashes which meet one another, by M. A. Trécul. On September 29, M. Trouvelot presented a paper on the identity in the structure of lightning and discharges from an induction machine. The author calls attention to the fact that he made similar observations ten years ago.—Observations of Brookes's comet (March 19, 1890), made with the great equatorial of Bordeaux Observatory, by MM. G. Rayet, L. Picart, and Courty. Seventy-one observations for position are given, extending from June 21 to October 12.—Remarks relative to a cause of variation of latitudes, by M. R. Radau. The movements of the sea, as well as certain meteorological phenomena (avalanches, &c.), may give rise to small deviations of the axis of our globe. It is shown that a mass of water 2000 cubic kilometres in size could produce an effect large enough to be observed.—On the established variations in the observations of the latitude of the same place, by M. A. Gaillot. Observations made at Berlin, Potsdam, and Prague, indicate that the latitude of a place is subject to a periodic variation, the maximum occurring in the summer, and the minimum in the winter, the amplitude of the oscillation about the mean value being ± 0″·25. M. Gaillot gives two hypotheses to account for this variation, and points out the means of testing each of them.

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